

PLAUSIBLE EXPLANATIONS FOR TRENDS IN PROJECT PROGRAMMATIC FINDINGS

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Abstract

This paper investigates several published hypotheses to determine which might explain the observed cyclic pattern in programmatic findings by independent review teams over a ten-year period. The data does not neatly support any of the intra-project theories considered; however, something is obviously triggering these findings. A closer examination of the narratives associated with the programmatic findings did reveal consistency. The recurring themes that appeared with more numerous findings were unclear roles and staffing problems. Other explanations, external to the project teams, were also explored and the data supported a distributed political influence on project performance.

Introduction

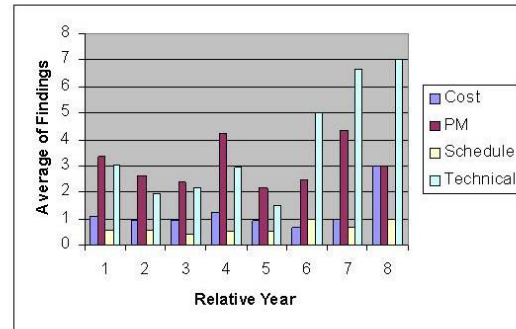
NASA's Independent Program Assessment Office is consolidating information from completed reviews into an electronic database. Certain programs and projects are subject to reviews by independent teams of experts at various times during their life cycle. While research into project management has attempted to classify the variables believed to affect project success, the results are generally inconclusive. The findings from these NASA independent reviews are classified as programmatic (PM), technical, schedule, or cost. Issues dealing with planning, project management, the team, contract management, risk identification and mitigation, and project management processes are counted in the programmatic category. An example of a programmatic finding is: "Develop a process to assure engineering development expertise is available through the end of the mission." Technical findings are much more project-specific and deal with the engineering, technology, or scientific aspects of the instrument, software, or spacecraft. Schedule findings include adequacy of reserves, observations of the interconnectivity of schedule tasks, and realism of task duration estimates. Cost findings pertain to budgeting, cost realism, and the perceived adequacy of reserves.

Exploration

An initial analysis of the findings documented in this NASA database revealed an cyclic trend for the findings classified as programmatic. The other categories did not display similar trends. For projects with multiple reviews, Exhibit 1 displays the average findings within each category by the order of the

individual project reviews, without regard to the actual year in which the review occurred.

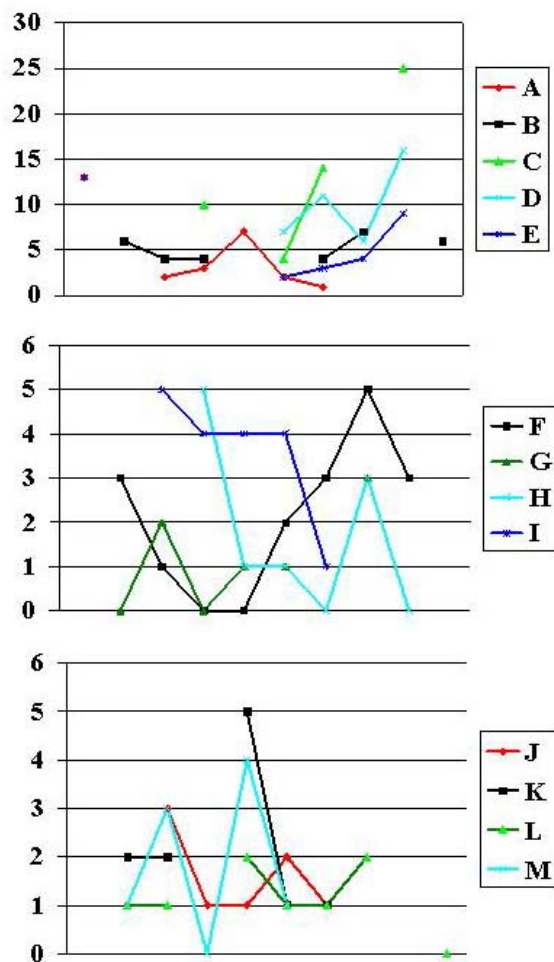
Exhibit 1. Average Findings by Category vs. Review



An early peak in programmatic issues would be expected since, "the personal elements of your project have to be resolved before budget and schedule" (Thomsett, 2002, p. 52). In contrast, when programs or projects have been reviewed more than three times between 1993 and 2002, there is often a cyclic pattern to the number of findings. Exhibit 2 illustrates this phenomenon. Since programmatics are clearly human-driven and human-controlled, the socio aspects of the project system would obviously have the largest effect on perceived shortcomings resulting in programmatic findings. Historically, Tuckman's (1965) model of team functioning has been the accepted norm. He believed that all teams passed sequentially through the five steps: forming, storming, norming, performing, and adjourning. The data trends observed here present a challenge as to whether this norm is supported. In particular, what steps would correlate with an increase in perceived programmatic shortfalls?

Logic would support a decrease in programmatic findings after a peak during the storming phase. However, the database cyclic pattern refutes that expectation. The data represents a more turbulent pattern within several projects while others experience a steadily increasing number of programmatic findings.

Exhibit 2. Number of Programmatic Findings by Review Year for Projects with More than Three Independent Reviews between 1993 and 2002



In contrast to Tuckman's model, Connie Gersick postulated a punctuated equilibrium explanation for team performance. Her observations of team functions revealed that groups proceed at a certain level until there is some trigger event, which serves to revise the group norms. In her research, this trigger point usually occurred half way through the project life cycle; so, she labeled it the project's mid-life crisis (Pinto, 2002). While the trends observed in the NASA database indicate changes in the programmatic findings over time, the peaks rarely coincide with the midpoint of the project lifecycle. So, this data does not support Gersick's hypothesis. The effectiveness of intra-team communications has also been hypothesized to affect project performance. However, this data does not coincide with the results of Tushman and Moore's (1988) empirical research, where fifty projects revealed communication increased during the first 1.5 years,

remained steady, and then began to decrease around the fifth year.

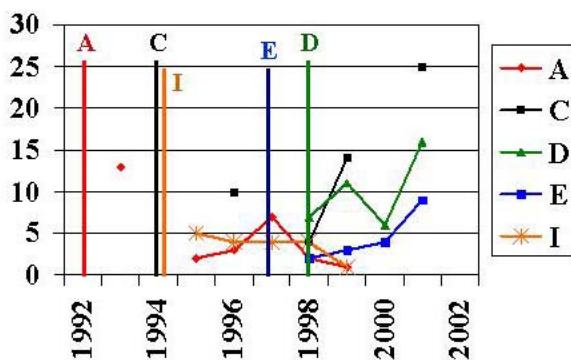
In search of an explanation for the cyclic pattern, several additional possibilities were considered. Pinto (2002) identified regulatory changes and environmental traumas as two project risk factors. NASA embraced ISO-9001 during 1998 and several highly publicized mission failures occurred during 1998 and 1999. So, the peak in programmatic findings during 1999 may be merely a reaction to those events. One plausible explanation is that independent review teams were synthesized by those events and more microscopic in their reviews. If this is accurate, the programmatic finding count may be an artifact of the review team and external factors in lieu of the project itself. However, a similar explanation for the peak in 2001 could not be identified. Also, some projects did not display a peak of programmatic findings in either of those years. In fact, the correlation between number of programmatic findings and actual year of review was only moderately significant at 0.29.

Murphy et al. (1974) surveyed 646 project personnel to identify factors perceived to affect project success. Among 32 factors identified, the political environment was one variable with a strong correlation to perceived project performance. Since there are differences in the missions and management practices of various NASA enterprises and centers, the next area investigated was whether the environments or cultures could explain the trends. Since NASA enterprise codes and centers are strictly nominal level data, non-parametric statistics were utilized to evaluate the relationships with the delta in programmatic findings. An average was calculated for the first through fourth review of projects within each NASA enterprise code. A Chi-square calculation indicated that the different number of findings by code is not likely to occur by chance ($\alpha < 0.001$). The same conclusion was reached in reference to NASA centers by a chi-square calculation ($\alpha < 0.001$). These statistics would tend to support Murphy's research results in that the political environment does affect the project performance as measured by programmatic findings during independent reviews.

Thamheine and Wilemon's barriers to teambuilding include a dynamic team environment (Cleland & King, 1988). Tippet and Peters (1995) studied 1667 people within 134 teams at 88 companies and organizations. Based on their results, they concluded that ignoring teambuilding probably results in the "loss of the best people and poor motivation on the part of those who remain." (p. 33) Detailed data on the timing of key personnel departures was not available for these projects. To determine the plausibility of this explanation, additional data would need to be captured.

Elrod and Tippet (1999) provided empirical support for Katzenbach and Smith's conceptualization of the relationship between team maturity and performance. Their sample of 112 projects from multiple technical enterprises resulted in a correlation of 0.557 with the Team Performance Curve advocated by Katzenbach and Smith. This supports the hypothesis that teams transverse from functioning to dysfunctional on the way to becoming potential, real, and finally high-performing teams. Since programmatic findings would be more numerous during the dysfunctional period if this hypothesis is supported, the peak should occur sometime after the initiation of the project team. Exhibit 3 visually depicts the relationship for those projects within the sample set that started within two years of the commencement of independent reviews. As the graph illustrates, with the exception of Project I, this data does not support Katzenbach and Smith's Team Performance Curve hypothesis. In fact, Project E appears to get progressively worse over time.

Exhibit 3. Trends of Programmatic Findings in Reference to Project Start Date (vertical lines)



In summary, Exhibit 4 cross references the various models and variables investigated with their effectiveness in explaining the data trend.

Exhibit 4. How Models and Variables Correlated with Observed Data Trend

Theory/Variable	Yes	No	Can't Tell	Somewhat
Tuckman Phasing		X		
Gersick Mid-Life Crisis		X		
Tuchman & Moore Communications Cycle		X		

Pinto Regulation Effect		X		
Year of Review				.29
Murphy Politics – Center	X			
Murphy Politics – Code	X			
Loss of Personnel (Thamhein, etc)			X	
Katzenbach & Smith Maturity		X		

Discussion & Conclusion

This data does not cleanly support any of the theories considered, with the exception of the political environment influence. However, there is still a wide variety in project programmatic findings within a particular enterprise code or center. Therefore, something, other than center or enterprise characteristics, is obviously affecting the projects' performance as measured by the number of programmatic findings. The Task Group Effectiveness Model of team performance postulated that focus, empowerment, structure, recognition, interdependence, and communication affect the team's success (Gladstein, 1984). Lewis (1998) postulated that good project teams are characterized by trust, open communication, team pride, enthusiasm, focus on goals, and interdependence. Communication and goal focus were also identified by Pinto and Slevin (1987) as key factors affecting project success. Lynn et al. (2000) collected data from 117 projects with questionnaires. Their regression analysis resulted in teamwork, communication, vision clarity, and market niche predicting subjective measures of success with $r^2 = 0.32$. Simple statistics fail to provide clarification for the cyclic trends within this database.

Sometimes, descriptions and qualitative individual analyses provide the best insight into observed trends. To further investigate, the findings were consolidated into two subtotals (first half and second half of the reviews) without regard to the actual years of the individual reviews. Only projects displaying a delta of more than two were retained for further analyses.

Exhibit 5. Table of Project Data

Project	1 st Half	2 nd Half	Code	Center	Delta
A	18	10	X	6	8
B	14	17	P	4	-3
C	14	39	T	5	-25
D	18	22	W	3	-4
E	5	13	X	1	-8
F	4	13	P	7	-9
G	2	5	X	1	-3
H	7	3	P	4	4
I	9	5	X	7	4

When investigating the programmatic findings for the nine projects summarized in Exhibit 5, a pattern of team variable effects on programmatic findings was discovered. Projects A, C, H, and I had unclear roles during the first half of their reviews. Projects B, C, E, and G had staffing problems during the second half of their reviews. These staffing problems ranged from the loss of key personnel to skill mix deficiencies. In contrast, Project I had staffing concerns during the first half and Project D suffered from inadequate staff and culture shock throughout. Projects A, H, and I were the only projects with higher programmatic findings during the first half of reviews. The search for trends within these comments tends to support a hypothesis that unclear roles significantly affect performance as measured by the number of programmatic findings. However, staffing problems overshadow the issue of unclear roles and generate increased adverse effects on project performance.

This paper took advantage of an available dataset for some exploratory research into the socio aspects of projects. The resulting hypothesis is that project team staffing issues are more important in determining project performance than the clarity of project goals. Further research is necessary to empirically test this hypothesis and evaluate the relative importance of staffing and clear goals in their effect on project performance.

About the Author

Vickie Parsons is currently a PhD candidate in Engineering Management at Old Dominion University (ODU). She holds an MPA from ODU with an emphasis in information sciences and a BS in mathematics from Virginia Polytechnic Institute. She has extensive experience managing project controls, systems engineering, and individual projects for NASA. As part of NASA's Independent Program Assessment Office, she currently performs reviews of NASA projects and programs with respect to

management, technical, schedule, and cost processes. Her research interests include project management, project metrics, and team dynamics.

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